

CLAIMS

I/We claim:

- [c1] 1. A microfeature device package system, comprising:
a microfeature device;
a plurality of device contacts electrically coupled to structures within the
microfeature device;
a conductive structure electrically connected to at least one of the plurality
of device contacts, the conductive structure having a plurality of first
and second package contacts accessible for electrical coupling to at
least one device external to the package, the first package contacts
being accessible from a first direction for coupling and the second
package contacts being configured to receive solder balls and being
accessible from a second direction for coupling, the second direction
being opposite the first direction; and
an encapsulant disposed adjacent to the microfeature device and the
conductive structure, the encapsulant having apertures with aperture
walls aligned with the second package contacts to contain solder
balls carried by the second package contacts.
- [c2] 2. The system of claim 1 wherein the conductive structure includes a
leadframe having a plurality of elongated leadfingers, and wherein the first
package contacts includes generally flat, elongated surfaces of the leadfingers,
and wherein the second package contacts include end surfaces of the
leadfingers.
- [c3] 3. The system of claim 1 wherein the microfeature device has an at
least generally planar first surface facing in the first direction and an at least
generally planar second surface facing in the second direction, and wherein the

plurality of device contacts are positioned at least proximate to the second surface.

[c4] 4. The system of claim 1 wherein the first package contacts are arranged in a first pattern, and wherein the second package contacts are arranged in a second pattern different than the first pattern.

[c5] 5. The system of claim 1 wherein the first package contacts are arranged adjacent to a periphery of the package, and wherein the second package contacts are arranged in an array with at least some of the second package contacts spaced apart from the periphery of the package.

[c6] 6. The system of claim 1, further comprising solder balls disposed on the second package contacts.

[c7] 7. The system of claim 1 wherein the conductive structure includes a leadframe attached to the microfeature device, and wherein the leadframe includes a plurality of elongated leadfingers, with each leadfinger having a first end portion positioned to make electrical contact a first type of external device, each leadfinger further having a second end portion wirebonded to at least one of the device contacts, each leadfinger still further having an intermediate portion between the first and second end portions, the intermediate portion carrying a solder ball to make electrical contact with a second type of external device.

[c8] 8. The system of claim 1 wherein the microfeature device includes a first microfeature device and wherein the device contacts include first device contacts, and wherein the package further comprises a second microfeature device having second device contacts and being stacked relative to the first microfeature device, with the conductive structure being electrically connected to at least one of the second device contacts.

[c9] 9. The system of claim 1, further comprising the device external to the package, and wherein the device external to the package includes a printed circuit board having circuitry electrically coupled to of the first package contacts or the second package contacts.

[c10] 10. The system of claim 1, further comprising:
the device external to the package, and wherein the device external to the package includes a printed circuit board having circuitry electrically coupled to the first package contacts or the second package contacts;
at least one of a processor and a memory device coupled to the printed circuit board;
an input device coupled to the printed circuit board;
an output device coupled to the printed circuit board; and
an enclosure disposed around the printed circuit board and the microfeature device.

[c11] 11. The system of claim 1, wherein the microfeature device includes a memory chip.

[c12] 12. A microfeature device package, comprising:
a microfeature device having an at least generally planar first surface facing a first direction and an at least generally planar second surface facing a second direction opposite from the first direction;
first and second device contacts positioned proximate to the second surface of the microfeature device, the device contacts being electrically coupled to structures within the microfeature device;
a conductive leadframe positioned at least proximate to the second surface of the microfeature device, the leadframe having first and second elongated leadfingers, each of the first and second leadfingers

having a first end surface, a second end surface, and a generally flat intermediate surface between the first and second end surfaces, each first end surface having a first package contact facing in the first direction, each intermediate surface having a second package contact facing in the second direction;

a first wirebond connected between the first device contact and the first leadfinger;

a second wirebond connected between the second device contact and the second leadfinger; and

an encapsulant disposed adjacent to the microfeature device and the leadframe, the encapsulant having apertures aligned with the second package contacts, the apertures having aperture sidewalls positioned to contain solder balls at the second package contacts, the first and second package contacts being accessible for coupling to devices external to the package, the first package contacts being accessible for coupling from the first direction, and the second package contacts being accessible for coupling from the second direction.

- [c13] 13. The package of claim 12, further comprising:
- a first solder ball disposed on the intermediate surface of the first leadfinger; and
- a second solder ball disposed on the intermediate surface of the second leadfinger.
- [c14] 14. The package of claim 12 wherein the first contacts are arranged in a first pattern and the second contacts are arranged in a second pattern different than the first pattern.

- [c15] 15. The package of claim 12 wherein the microfeature device includes a first microfeature device, and wherein the package further comprises a second microfeature device stacked relative to the first microfeature device and electrically connected to the conductive leadframe.
- [c16] 16. A microfeature device package, comprising:
a first microfeature device having a plurality of first device contacts;
a second microfeature device having a plurality of second device contacts,
the second microfeature device being coupleable to the first
microfeature device in either of two orientations, wherein in a first
orientation, the second device contacts face toward the first device
contacts and in a second orientation, the first and second device
contacts face in opposite directions; and
a conductive structure positioned at least proximate to the first and second
microfeature devices, the conductive structure being electrically
connected to at least one of the first device contacts and to at least
one of the second device contacts.
- [c17] 17. The package of claim 16 wherein the conductive structure includes:
a first leadframe wirebonded to the first device contacts;
a second leadframe wirebonded to the second device contacts; and
a plurality of couplers electrically connected between the first and second
leadframes.
- [c18] 18. The package of claim 16 wherein the conductive structure includes a
plurality of first package contacts arranged in a first pattern and a plurality of
second package contacts arranged in a second pattern, with the second pattern
being at least approximately the same as the first pattern.

[c19] 19. The package of claim 16 wherein an arrangement of the first device contacts mirrors an arrangement of the second device contacts.

[c20] 20. The package of claim 16 wherein at least one the first device contacts includes an input contact and at least one of the second device contacts includes an output contact, further wherein the conductive structure is coupled between the at least one first device contact and the at least one second device contact to direct output signals from the second microfeature device to the first microfeature device.

[c21] 21. The package of claim 16 wherein at least a portion of the conductive structure is positioned between the first and second microfeature devices.

[c22] 22. The package of claim 16 wherein at least a portion of the conductive structure extends around peripheral edges of the first and second microfeature devices.

[c23] 23. A microfeature device package, comprising:
a first microfeature device having at least one first device contact;
a second microfeature device having at least one second device contact
and being stacked relative to the first microfeature device;
a first conductive leadframe positioned at least proximate to the first
microfeature device, the first leadframe having at least one
elongated first leadfinger, the first leadfinger having a first end
surface, a second end surface and a generally flat, intermediate
surface between the first and second end surfaces, the intermediate
surface and the second end surfaces facing in opposite directions,
the first leadframe further having a first terminal portion that includes
the intermediate surface or the second end surface of the first
leadfinger;

a first wirebond connected between the at least one first device contact and the at least one first leadfinger;

a second conductive leadframe positioned at least proximate to the second microfeature device, the second leadframe having at least one elongated second leadfinger, the second leadfinger having a first end surface, a second end surface and a generally flat, intermediate surface between the first and second end surfaces, the intermediate surface and the second end surfaces facing in opposite directions, the second leadframe further having a second terminal portion that includes the intermediate surface or the second end surface of the second leadfinger;

a second wirebond connected between the at least one second device contact and the at least one second leadfinger;

a conductive coupler connected between the first and second leadframes; and

an encapsulant disposed adjacent to the first and second microfeature devices with the first and second terminal portions accessible to provide electrical coupling with devices external to the package, the first terminal portion being accessible from a first direction for coupling, the second terminal portion being accessible from a second direction for coupling, the second direction being opposite the first direction.

[c24] 24. The package of claim 23 wherein the first terminal portion includes a plurality of first package contacts arranged in a first pattern, and wherein the second terminal portion includes a plurality of second package contacts arranged in a second pattern, with the second pattern being different than the first pattern.

[c25] 25. The package of claim 23 wherein the first terminal portion includes a plurality of first package contacts arranged in a first pattern, and wherein the

second terminal portion includes a plurality of second package contacts arranged in a second pattern, with the second pattern being at least approximately the same as the first pattern.

[c26] 26. The package of claim 23 wherein at least one the first device contacts includes an input contact and at least one of the second device contacts includes an output contact, further wherein the conductive structure is coupled between the at least one first device contact and the at least one second device contact to direct output signals from the second microfeature device to the first microfeature device.

[c27] 27. The package of claim 23 wherein at least a portion of the conductive structure is positioned between the first and second microfeature devices.

[c28] 28. The package of claim 23 wherein at least a portion of the conductive structure extends around peripheral edges of the first and second microfeature devices.

[c29] 29. A method for forming a microfeature device package, comprising:
disposing a conductive structure at least proximate to a microfeature device, the conductive structure having a plurality of first and second package contacts accessible for electrical coupling to at least one device external to the package, the microfeature device having a plurality of device contacts electrically coupled to structures within the microfeature device;
orienting the conductive structure with the first and second package contacts accessible for electrical coupling to devices external to the package, the first package contacts being accessible from a first direction for coupling and the second package contacts being

accessible from a second direction for coupling, the second direction being opposite the first direction;
electrically coupling the conductive structure to the device contacts of the microfeature device; and
disposing an encapsulant adjacent to the conductive structure, the encapsulant having apertures aligned with the second package contacts, the apertures having aperture walls positioned to contain solder balls at the second package contacts.

[c30] 30. The method of claim 29 wherein the conductive structure includes a leadframe having a plurality of elongated leadfingers, and wherein orienting the conductive structure with first and second package contacts positioned to provide electrical coupling with devices external to the package includes orienting end surfaces of the leadfingers to be accessible from the first direction for coupling and orienting generally flat surfaces of the leadfingers to be accessible from the second direction for coupling.

[c31] 31. The method of claim 29 wherein orienting the conductive structure includes orienting the conductive structure with the first package contacts arranged in a first pattern the second package contacts in a second pattern different than the first pattern.

[c32] 32. The method of claim 29 wherein orienting the conductive structure includes positioning the first package contacts adjacent to a periphery of the package, and positioning the second package contacts in an array with at least some of the second package contacts spaced apart from the periphery of the package.

[c33] 33. The method of claim 29 wherein orienting the conductive structure includes orienting a conductive structure having a leadframe, and wherein the

leadframe includes a plurality of elongated leadfingers, with each leadfinger having a first end portion wirebonded to at least one of the device contacts, each leadfinger further having a second end portion positioned to make electrical contact with a first type of external device, each leadfinger still further having an intermediate portion between the first and second end portions, the intermediate portion carrying a solder ball to make electrical contact with a second type of external device different than the first type of external device.

- [c34] 34. The method of claim 29, wherein the microfeature device includes a first microfeature device and wherein the device contacts include first device contacts, and wherein the method further comprises:

stacking a second microfeature device proximate to the first microfeature device, the second microfeature device having second device contacts; and
electrically connecting the conductive structure to at least one of the second device contacts.

- [c35] 35. A method for forming a microfeature device package, comprising:
positioning a first microfeature device at least proximate to a second microfeature device, the first microfeature device having first device contacts, the second microfeature device having second device contacts, the second microfeature device being coupleable to the first microfeature device in either of two orientations, wherein in a first orientation, the second device contacts face toward the first device contacts and in a second orientation, the first and second device contacts face in opposite directions;
orienting the second microfeature device in one of the first and second orientations;

disposing a conductive structure at least proximate to the first and second microfeature devices, the conductive structure having first and second terminal portions; and
electrically coupling the conductive structure to the first device contacts of the first microfeature device and to the second device contacts of the second microfeature device.

[c36] 36. The method of claim 35, further comprising orienting the conductive structure with the first and second terminal portions positioned to provide electrical coupling to at least one device external to the package, the first terminal portion being accessible from a first direction for coupling and the second terminal portion being accessible from a second direction for coupling, the second direction being opposite the first direction.

[c37] 37. The method of claim 35 wherein disposing the conductive structure includes disposing at least a portion of the conductive structure between the first and second microfeature devices.

[c38] 38. The method of claim 35 wherein disposing the conductive structure includes disposing at least a portion of the conductive structure adjacent to peripheral edges of the first and second microfeature devices.

[c39] 39. The method of claim 35 wherein electrically coupling the conductive structure to the first and second microfeature devices includes wirebonding the conductive structure to the first and second microfeature devices.

[c40] 40. A method for assembling a microfeature device system, comprising:
positioning a microfeature device package proximate to an external device,
the microfeature device package having at least one microfeature device electrically coupled to a conductive structure, the conductive

structure having first and second terminal portions accessible for electrical coupling to an external terminal portion of the external device, the first terminal portion having first package contacts accessible from a first direction for coupling, the second terminal portion having second package contacts configured to receive solder balls and being accessible from a second direction for coupling, the second direction being opposite the first direction, the microfeature device package further having an encapsulant disposed adjacent to the microfeature device and the conductive structure, the encapsulant having apertures with aperture walls aligned with the second package contacts to contain solder balls carried by the second package contacts;

selecting one of the first and second terminal portions for coupling with the external terminal portion; and

coupling the one of the first and second terminal portions with the external terminal portion.

[c41] 41. The method of claim 40, further comprising orienting the one of the first and second terminal portions to face toward the external terminal portion.

[c42] 42. The method of claim 40, further comprising:

determining if the external terminal portion is more compatible with the first terminal portion than with the second terminal portion;

if the external terminal portion is more compatible with the first terminal portion than with the second terminal portion, coupling the external terminal portion to the first terminal portion of the microfeature device package; and

if the external terminal portion is more compatible with the second terminal portion than with the first terminal portion, coupling the external terminal portion to the second terminal portion.

[c43] 43. The method of claim 40 wherein positioning a microfeature device package proximate to an external device includes positioning the microfeature device package proximate to a printed circuit board having circuitry, and wherein coupling the one of the first and second terminal portions with the external terminal portion includes coupling the one terminal portion with the circuitry of the printed circuit board.

[c44] 44. The method of claim 40 wherein positioning a microfeature device package proximate to an external device includes positioning the microfeature device package proximate to a printed circuit board having circuitry, and wherein coupling the one of the first and second terminal portions with the external terminal portion includes coupling the one terminal portion with the circuitry of the printed circuit board, and wherein the method further comprises:

coupling at least one of a processor and a memory device to the printed circuit board;

coupling an input device to the printed circuit board;

coupling an output device to the printed circuit board; and

disposing an enclosure around the printed circuit board and the microfeature device.

[c45] 45. The method of claim 40 wherein positioning a microfeature device package proximate to an external device includes positioning a microfeature device package having first and second stacked microfeature devices.